



Foreign  
Assessment  
Center

# **International Energy Biweekly Review**

**20 September 1978**

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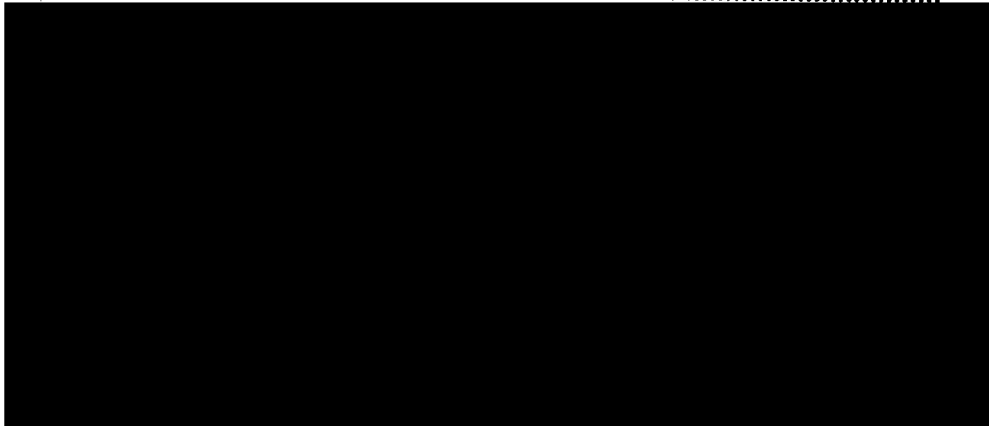
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## INTERNATIONAL ENERGY BIWEEKLY REVIEW

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## FRANCE: NEW OIL IMPORT AND MARKET POLICIES

Paris announced, in late August, that it is revamping its oil policy. Earlier policy, based largely on 1928 legislation, provided for virtual total government control over oil supply sources and domestic marketing as well as for government guarantees of specified shares of the French market to domestic firms. The new policy is a logical extension of recent economic liberalization measures aimed at creating a more open and internationally competitive economy.\*

Unbridled competition is not in the cards, however. Although the government will be flexible, it also will maintain close supervision over the oil industry. The industry itself probably will have a hard time adjusting to the new system.

**Imports**

The government's system for authorizing oil company operations will be maintained. It includes 10-year authorizations for crude oil imports, refining, and marketing and three-year authorizations for product imports. Oil companies will still be required to submit import plans for government approval as Paris still wants to ensure source diversification and a desirable balance between crude and product imports.

To stimulate competition, however, Paris will allow more companies to import oil products. It is not yet clear how the additional importing companies will be chosen, but renegotiation of product import authorizations will begin on 1 January 1979, and new authorizations will be announced next June to take effect on 1 January 1980.

The government's import quota system also will be eliminated. Under the previous system, authorizations were combined with quotas, enabling the government to allocate portions of the market to French companies. EC Commission approval is needed to eliminate quotas but should not be difficult to obtain given the Commission's past criticism of tight regulation of oil trade. Moreover, a share of total imports, probably on the order of 15 percent to 20 percent, will be entirely decontrolled to allow for spot purchases and to promote competition.

**Prices**

Prices for heavy fuel oil and naphtha were decontrolled on 7 July as part of the government program to eliminate industrial price controls. The prices of gasoline,

\* See CIA ER EIWR 78-023, 8 June 1978, "France: A Bold Reduction of Government Intervention," (Secret Noform-Nocontract).

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diesel oil, and home heating oil, however, will not be completely freed until 1 January 1980. In the meantime, Paris has established an interim, probationary period in which exrefinery ceiling prices will be recalculated periodically according to a formula that takes into account taxes, refinery costs, the dollar price of crude, and the dollar/franc exchange rate. Crude oil price changes will be reflected exrefinery, 45 days after the change; franc/dollar exchange rates will be refixed by the government every two or three months.

There will be a floor price for gasoline only. Unrestricted discounting will be allowed for residential fuel and diesel oil. In addition, heating oil distribution quotas, adopted in 1974 to reduce consumption, will be eliminated.

Retail gasoline prices were recently the subject of a public disagreement within the government. In mid-August, Economics Minister Monory announced that prices would be reduced to reflect the refiners' increased profit margins resulting from the decline of the dollar relative to the French franc. Prime Minister Barre responded immediately and angrily that oil was scarce and its consumption should not be encouraged. Thus, as part of the new oil policy, it was announced that the ex-refinery price of motor fuels would drop by 6.85 centimes per liter (6 cents per gallon) as of 2 September 1978, but that this amount would be paid to the government's Energy Conservation Agency (ECA) rather than reflected in consumer prices.

On 1 January 1979, this forced contribution to the ECA is to be eliminated, to the potential benefit of the consumer, but OPEC is expected to raise crude prices at that time. Moreover, the 1979 budget calls for a 4.8-percent increase in gasoline taxes on 1 January. The January tax increase, if reflected at the pump, would bring the retail price of premium gas to nearly \$2.50 per gallon. French gasoline is already the highest priced in Western Europe.

The government will, however, permit increased—perhaps doubled—discounts on gasoline during the probationary period. Heretofore, Paris—bowing to pressure from small retail dealers—has limited such discounts to 5 centimes per liter (4.4 cents per gallon) for regular and 6 centimes per liter (5.2 cents per gallon) for premium. Bigger discounts will be welcomed by consumers as well as the large “supermarket” service station chains that currently account for about 10 percent of total gasoline sales.

Still another feature of the government's proposed new price system is a requirement that oil companies publish price lists. This requirement is intended to discourage market manipulation. EC approval must be received before this measure can take effect.

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### **The Role of French Companies**

These two key features of past government oil policy have apparently been abandoned: (1) the 1968 government decree that French oil companies—today Elf-Aquitaine and Compagnie Francaise des Petroles (CFP)—combined would have at least half of the national market, and (2) the goal of controlling production equivalent to national needs, that has not been achieved since the late 1960s.

Countering arguments by the French companies that they cannot compete effectively with the larger foreign firms in exploration, Industry Minister Giraud pointed to Elf's current annual cash flow of 5.5 billion francs (\$1.25 billion) and to the government's recent decision to allow an increase in CFP's capitalization. Giraud also raised the possibility of government financial assistance to the companies after they have made refinery operations more efficient and profitable, that is, after 1980.

### **New System Still Evolving**

A one-year probationary period is not long for a market that has been protected for half a century. Giraud, in fact, admitted that the period may be extended.

A major question—as with previous French liberalization measures—is how far Paris can, or will, go in the face of opposition from groups affected adversely by the new policies. French oil companies—the refinery sector in particular—and the unions clearly are disturbed by the prospect of increased competition from the major international oil companies. Moreover, France's 45,000 small independent gasoline dealers—already feeling growing competition from the large service centers that obtain bulk discounts—are hostile to even a limited increase in price discounting and have already threatened a strike.

On the other hand, it is not clear how strongly foreign companies will push to increase their shares of the French market, particularly given the uncertainty about the government's intent. The competitiveness of Elf and CFP against foreign refiners and distributors is also an unknown.

In any event, Paris will not allow a large-scale foreign invasion of the French oil market nor will it permit the many small retailers to be driven out of business. It still maintains these relatively formidable powers to fix the extent and speed of change: (a) control over the origin of crude supplies, (b) control over the proportion of crude to product imports, and (c) control over the total oil import bill.

President Giscard and Premier Barre appear in complete agreement, and they clearly have control over policymaking. Their clout was demonstrated recently when

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they overruled proposals by the Ministries of Economy and Industry, the former calling for the decline in retail gasoline prices and the latter for continued government assistance to French oil companies.

Although described by Barre as "irreversible," the government's program is still evolving and will be applied flexibly. French oil refiners and independent dealers will face a more difficult time. The possibility of a totally unfettered oil market can, however, be ruled out. (Confidential)

\* \* \* \* \*

### IRAN: NEW GOVERNMENT MAINTAINS LOW ECONOMIC PROFILE

Appointed in an effort to contain conservative/religious dissidence, Iran's new Prime Minister, Ja'far Sharif-Emami, probably will delay making major economic policy changes until he can establish a greater measure of domestic calm. In the interim, he is likely to carry on with the go-slow economic policy of his predecessor, stretching out the time frame for ambitious development schemes while attacking the more immediate problems of sluggish agricultural production and rapid inflation. The government also will attempt to resolve the current impasse in negotiations on a new operating agreement with the consortium of international oil companies (OSCO) that produces the major Khuzestan fields.

In his initial economic pronouncement, the Prime Minister stressed the conservative values that could be expected to secure the Shah support from disaffected Muslim leaders and their followers. He called for programs to spread the benefits of economic development to rural areas and reiterated the now-standard call for a gradual return to agricultural self-sufficiency, a goal that has been bypassed during Iran's helter-skelter development drive. The new government intends to proceed with agriculture and transportation projects already under way, but it will reassess all other economic programs.

### Problems of Oil Boom

Iranian economic policy since the 1973/74 oil price hikes has sought to create a modern, diversified industrial sector which would become the major source of revenues when oil production begins to level out in the mid-1980s. At the same time, the Shah has opted for development of a sophisticated military force to make Iran the dominant power in the Persian Gulf and for a large-scale nuclear powerplant construction program to further reduce the country's dependence on oil.



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The Shah's expansionary military and industrial drive pushed demand—particularly in the construction sector—far beyond the capability of the local economy to supply labor, materials, and supporting facilities. Rather than curb demand, the Shah relied on price rollbacks and controls on profits to moderate the inflationary impact of his program. The construction boom continued, however, and with the accompanying surge in industrial wages and bank credits, inflation became endemic.

In emphasizing capital-intensive heavy industry, Iranian policymakers neglected to promote the private sector, particularly agriculture. Self-sufficient in food through 1969, Iran now provides only about 75 percent of its needs. With agricultural output rising less than 5 percent a year, and demand—spurred by rapid population and income growth—climbing as much as 8 percent, the share could fall to 60 percent or less in the mid-1980s.

Sharif-Emami's immediate predecessor, Jamshid Amuzegar, launched an attack on these problems last summer shortly after taking office. Monetary and fiscal policies were tightened, building permits restricted, and rent controls instituted. The Amuzegar government actually held public spending below authorized levels for most of its tenure. Expenditures did surge in February-March 1978, but this probably was generated by the realization that spending authorizations for many projects would expire in March, at the end of the current five-year plan. Signaling a change in the Shah's attitude, a major review of development priorities was begun, and tax and labor reforms were promised. But the reforms never appeared, and the long-overdue five-year plan for March 1978 to March 1983 never was published.

### Recent Economic Developments

Amuzegar's policies brought some relief on the price front. After rising at a rate of 22 percent in 1976 and 24 percent in 1977, the cost of living went up at an annual rate of 16 percent in the first five months of 1978. The cost of housing and fuels actually fell 4 percent in January-May, although food and beverage prices continued to climb substantially.

The shift in government policy reinforced a slowdown in GNP growth already in the works because of slumping oil and agricultural output. Real GNP grew only 3 percent in 1977; bad weather caused agricultural production to decline 0.8 percent, and weak demand for oil kept output at 5.7 million b/d, compared with 5.9 million b/d in 1976. Sluggish growth in investment—up only 6 percent last year, compared with a 57 percent gain in 1975 and a 12 percent rise in 1976—together with electric power blackouts, held down activity in the industrial and service sectors.

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Given the shaky political situation, private investment, which declined 1 percent last year, is not likely to pick up much. Increases in public investment and private consumption probably will boost real GNP 4 to 7 percent this year. Even if oil demand strengthens faster than expected, economic growth will continue to be constrained by limitations of the internal transport system and by a serious shortage of skilled labor and engineering personnel. The government's own figures indicate that one out of every three skilled positions will remain unfilled into the mid-1980s.

With oil output down and imports continuing to grow, Iran's current account surplus remains far below the \$13 billion peak of 1974. Despite the overall economic slowdown, imports last year increased by 11.5 percent in nominal terms; a falloff in oil export volume was more than offset by the OPEC oil price hike of January 1977, oil revenues rising 5 percent. This year oil revenues probably will remain about the same, while increased imports and service payments should drive the current account surplus down to the \$2 billion level.

### Limited Spinoff for Man in the Street

Many Iranians have gained little from the oil and construction boom, and discontent with the Shah's development priorities has added to political and religious unrest. Although per capita income has grown by more than 60 percent in real terms since 1972, almost half of Iran's population still lives in backward rural areas and reportedly receives incomes about one-fifth those of city dwellers.

Higher wages and the government's neglect of agriculture have contributed to accelerated rural-to-urban migration. Ironically, food prices generally are lower in the cities because price controls are more strictly enforced. Increasing urbanization is enlarging the pool of unemployed unskilled labor, which clearly numbers more than the 200,000 acknowledged by the government. This group of unemployed could act as a destabilizing force during a period of social and political unrest. Even among the urban employed, increasing signs of labor unrest have emerged—featuring wildcat strikes by workers who claim that their wages have failed to keep up with inflation.

### Revision of Priorities?

The need to placate the conservative elements who have been at the forefront of recent demonstrations may lead to some shift in government policy away from industrial and nuclear development and toward the agricultural sector. Such a shift—previously hinted at by the Amuzegar government, which was reevaluating the massive planned nuclear power buildup—would help appease the traditionalists who fear the corrosive influence of increasing urbanization on moral values. At the same time it would help postpone the emergence of the payments gap towards which Iran

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now seems to be headed if it boosted farm output and moderated import growth across the board.

Unless oil prices rise substantially, Tehran's present development program will put the current account in sizable deficit by the early 1980s. We expect the growth in imports to speed up in the next several years. Military imports are apt to remain high, while payments for nuclear equipment already ordered will begin to accelerate in the early 1980s. Food imports, now running at \$2 billion a year, are likely to balloon with consumption encouraged by a \$1 billion a year government program of food price subsidies.

At the same time, the outlook for industrial and energy exports is dim. Products from the Shah's ambitious industrial development program, while expected to provide some import substitutes over the next several years, will encounter weak world demand.

**Energy Sector**

Oil production, which still accounts for the bulk of export earnings, is approaching its peak and probably will begin to decline in the early 1980s. Current maximum sustainable capacity of about 6.5 million b/d is likely to fall off to 5.0 million to 6.0 million b/d by 1985 as delays continue to occur in secondary recovery projects—including a massive gas injection program—as well as in the exploration and development drilling program.

Exports of gas will not take up the slack. Although Iran's gas reserves—estimated at 500 trillion to 600 trillion cubic feet—are the second largest in the world, developing the facilities to produce, process, and deliver the gas will be time-consuming and expensive. Moreover, with export commitments to the USSR and requirements for the gas injection program requiring more than a doubling of current gas output, the availability of gas for export is expected to grow only moderately in the next decade.

**Unfinished Business**

Negotiations between OSCO and NIOC continue. Most issues—including requiring OSCO to lift a minimum of 3.3 million b/d during the next five years—apparently have been resolved. But two points remain:

(1) OSCO is demanding a service fee for each barrel of oil produced; NIOC wants the fee applied only to the number of barrels OSCO actually lifts.

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(2) NIOC insists on a "most favored nation" (MFN) clause under which more favorable terms granted by any OSCO company to any other host government also would be applied to Iran. OSCO is holding out for an MFN change that would compare terms for Iran only with those for other Persian Gulf countries. (Confidential)

\* \* \* \* \*

## OPEC ECONOMIC AID: FLOWS AND EBBS

Net disbursements of Official Development Assistance (ODA)\* by OPEC member countries surged to a record \$5.8 billion in 1977 and then began to slide in 1978. Greatly increased Kuwaiti aid to the Arab confrontation states through both the Gulf Organization for the Development of Egypt (CODE) and renewed Rabat payments, together with sharply higher Saudi and UAE assistance to favored Arab states in Africa, raised the 1977 OPEC economic aid total to more than 15 percent above the previous 1975 peak. As a result, OPEC contributed an unprecedented 30 percent of all aid transferred to non-OPEC LDCs and multilateral aid institutions in 1977. The retrenchment in OPEC aid outlays in 1978—20 percent or more—is attributable mainly to intermittent cash flow problems in the donor countries.

## Three-Donor Program

Saudi Arabia, Kuwait, and the United Arab Emirates clearly emerged during 1977 as the three dominant OPEC aid donors, together responsible for about 85 percent of the ODA total. This triad of Arab Gulf states—pursuing parallel foreign policy goals, often in support of conservative or moderate Islamic governments—have coordinated their aid activities through a combination of consortium and co-financing arrangements. Most other OPEC donors have trimmed their outlays due to actual or perceived financial difficulties. Iran, particularly, cut its transfers last year, to one-half the 1976 total and stopped almost all new commitments.

Libya, frequently working at cross purposes with Riyadh in its foreign policy objectives, increased its economic aid in 1977. While the Saudis poured money into North Yemen, Somalia, and Mauritania, Libya provided financial succor to radical opponents of Saudi policies, such as South Yemen, Ethiopia, and Algeria.

\* Official Development Assistance, as defined by the OECD Development Assistance Committee, must (a) be given by governments or government-sponsored institutions, (b) contain grant elements of at least 25 percent, and (c) directly enhance economic development or welfare.

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## Disbursement of Official Development Assistance, by OPEC Donor

|                               | Million US \$ |       |
|-------------------------------|---------------|-------|
|                               | 1977          | 1976  |
| Saudi Arabia .....            | 2,660         | 2,330 |
| Kuwait .....                  | 1,410         | 440   |
| UAE .....                     | 880           | 820   |
| Iran .....                    | 385           | 725   |
| Libya .....                   | 150           | 120   |
| Iraq .....                    | 145           | 175   |
| Qatar .....                   | 125           | 150   |
| Other .....                   | 105           | 110   |
| Total gross .....             | 5,860         | 4,870 |
| Repayments <sup>1</sup> ..... | 100           | 50    |
| Total net .....               | 5,760         | 4,820 |

<sup>1</sup> Repayments were made predominantly to Kuwait and secondarily to Iran.

## Bilateral Programs Stressed

OPEC countries provided 85 percent of their aid bilaterally in 1977. These direct bilateral transfers—which the governments have long considered a more effective foreign policy tool than other aid forms—rose to \$5 billion in 1977, from \$4 billion the year before. The transfers included (a) more than \$700 million in payments to Mauritania, Morocco, and Somalia, compared with \$200 million in 1976; (b) the revival of Rabat payments, suspended in 1976, to a level of nearly \$800 million; and (c) the restoration of Kuwaiti Government soft-term loans to Egypt, through the newly created GODE. In addition, the combined net project aid disbursements of the Saudi Development Fund, the Kuwait Fund for Arab Economic Development, and the Abu Dhabi Fund for Arab Economic Development, purportedly given without political consideration, rose from about \$350 million in 1976 to more than \$500 million in 1977.

As in the past, nonproject assistance weighed heavily in the OPEC bilateral total. Even though the major OPEC donors have paid increasing homage to the merits of project aid, the pressing needs of major clients for immediate financial support have repeatedly caused donors to defer long-term project assistance. Furthermore, budget support and direct balance-of-payments assistance—flexible and quickly disbursable forms of aid—have both proven invaluable to the foreign political goals of OPEC donors. Even GODE aid, established initially by the Arab Gulf states for coordinating and administering project assistance to Egypt, was ultimately used to bail Cairo out from its 1977 balance-of-payments crisis. In all, nonproject aid has accounted for more than three-fourths of OPEC bilateral ODA, compared with the less than 50-percent share long characteristic of ODA from industrialized countries.

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OPEC economic assistance continued to be less concessional in nature than aid from industrialized countries. In 1977, for example, 45 percent of OPEC bilateral ODA transfers was grant aid compared with about 70 percent of transfers from industrialized countries.

### Stable Multilateral Program

OPEC contributions to multilateral aid institutions in 1977 held at the 1976 level, just under \$800 million. The OPEC Special Fund, which received about one-fourth of the contributions, became the most dynamic and widely used of the OPEC multilateral institutions. With a total pledged capital of \$1.6 billion, by the end of 1977 the Special Fund had: (a) committed \$339 million of direct project and balance-of-payments assistance to 60 non-OPEC LDCs around the world, (b) pledged \$435 million to the International Fund for Agricultural Development (IFAD), and (c) begun consideration of a major contribution to the Common Fund, proposed by UNCTAD as a key feature of the Integrated Program for Commodities. OPEC countries also contributed large sums to the Islamic Development Bank, the newest and largest of the OPEC multilateral organizations, and the Arab Bank for Economic Development in Africa (ABEDA). OPEC states upped ABEDA's capital early last year as a concession to African states which sought more Arab assistance.

### Mainly Arab Beneficiaries

Again in 1977, OPEC countries concentrated their bilateral ODA assistance on Arab and other Moslem recipients, with 83 percent destined for the former and an additional 8 percent to the latter. The Arab confrontation states again absorbed the bulk of the total, Egypt and Syria alone taking 45 percent. Jordan would have assumed

Disbursements of OPEC Bilateral Official Development Assistance,  
by Leading Recipients

|                   | Million US \$ |       |
|-------------------|---------------|-------|
|                   | 1977          | 1976  |
| Egypt .....       | 1,590         | 1,100 |
| Syria .....       | 695           | 540   |
| Oman .....        | 340           | 110   |
| Morocco .....     | 320           | 35    |
| Jordan .....      | 290           | 475   |
| India .....       | 275           | 495   |
| Somalia .....     | 230           | 45    |
| North Yemen ..... | 215           | 140   |
| Mauritania .....  | 180           | 115   |
| Lebanon .....     | 160           | 20    |

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its customary third place ranking had it not received in advance (in 1976) \$140 million to cover Riyadh's Rabat payments obligations for 1977 and 1978. India has maintained a special place as a favored aid client of Iran's, largely reflecting Tehran's drive to strengthen its economic ties with the non-Arab countries of middle Asia.

OPEC bilateral assistance to the especially disadvantaged groups of LDCs remained comparatively small in 1977. The listing below shows the share of each of three groups usually classified as disadvantaged but which to some extent are duplicative. India and Pakistan are excluded from the first but included in the second and third groups:

- Least Developed Countries (LLDCs) received \$856 million, or 17 percent of OPEC bilateral ODA.
- Most Seriously Affected (MSA) countries, other than Egypt, received \$1,461 million, or 29 percent of the total.
- Non-OPEC, non-Communist LDCs with \$265 or less annual per capita income received \$1,235 million, or 24 percent of the total.

### Trends in 1978

Preliminary information indicates that OPEC transfers of official development assistance will fall at least 20 percent in 1978. We expect only the two radical countries of Libya and Iraq to surpass their 1977 aid performances. The conservative Arab Gulf states are cutting back their programs in 1978. Although these states continue to receive enormous sums from oil sales and have large foreign assets, some are encountering intermittent cash shortages because of a combination of poor budgeting, reduced oil sales, high imports, international inflation, and the declining value of the dollar. We also expect Iran's role as a major donor to continue to wane. Tehran's 1978 transfers will probably fall again, as last year, by as much as one-half.

Because of their dependence on the Gulf donors, the confrontation states will be most severely affected. For example, disbursements through CODE to Egypt will decline sharply in 1978 as a result of the Gulf states' decision in July not to replenish CODE's nearly exhausted capital. Also, the annual Rabat payments due the confrontation states are moving far more slowly than a year ago, with less than \$250 million in payments noted in first half 1978, compared with nearly \$800 million for all of 1977 (most of which occurred in the first half of the year).

Those non-OPEC LDCs that appear to be receiving more OPEC bilateral aid this year than in 1977 are predominantly leftist—those with ties to the radical donor states.

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Already, Libya has transferred large amounts of assistance to Ethiopia, and South Yemen has received sizable aid from Iraq. Libya pledged major support to South Yemen in the aftermath of the decision by other more moderate Arab states to impose an economic boycott on Aden. Iraq also has transferred substantial amounts of ODA to Guinea and Congo. (Secret NoFORN)

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## USSR: COAL PRODUCTION PROBLEMS

Coal production in the USSR during the first seven months of 1978 failed to increase over the same period of 1977, and Soviet officials are expressing concern.

The industry's performance has been deteriorating since the outset of the 10th Five-Year Plan (1976-80). In 1977, Soviet raw coal output of 722 million tons fell 11 million tons short of plan. The plan shortfall in 1978 probably will be more than 20

## USSR: Raw Coal Production

|            | Million Tons     |                  |
|------------|------------------|------------------|
|            | Plan             | Actual           |
| 1975 ..... | 695              | 701              |
| 1976 ..... | 715              | 712              |
| 1977 ..... | 733              | 722 <sup>1</sup> |
| 1978 ..... | 746 <sup>2</sup> |                  |
| 1979 ..... | 775              |                  |
| 1980 ..... | 805              |                  |

<sup>1</sup> Net production after coal cleaning operations was reported to be 664 million tons, about one-fifth the world total and 5 percent more than US output of 630 million tons. However, Soviet coal is of lower quality than US coal so that in terms of heating value, Soviet output was about 15 percent less than US output.

<sup>2</sup> Revised from an original goal of 750 million tons.

million tons. Production in the Donetsk Basin, where mining is now being conducted at great depths after 200 years of operation, actually declined in 1977 and in first-half 1978; Donetsk coal still accounts for almost one-third of the country's output, however.

Coal production problems have already resulted in inadequate deliveries of coking coal to the steel industry. Other shortages are likely to show up during the winter.

Coal Minister Bratchenko attributes the industry's poor performance to inadequate preparation of new coal faces, shortages of labor and mining equipment, and



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poor mine management. Other reports indicate that shortages of rail cars to transport the coal are hampering production and that construction of new mines is lagging.

Bratchenko indicated early this year that the 1990 goal of 1 billion tons would not be achieved before the year 2000. This level of output will require large-scale development of brown coal deposits in Siberia, a project that is barely under way. Moreover, because this coal ignites spontaneously, it must be consumed in the area or beneficiated prior to shipment. Local consumption, in turn, will involve the construction of mine-mouth power plants and high voltage transmission lines to ship the electric power to where it is needed in the Urals and the European part of the USSR. Some of the necessary power transmission technology is not yet available in the USSR. (Unclassified)

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## USSR: PUMPED STORAGE USE \*

A unique electricity-generating complex under construction in the western Ukraine will consist of nuclear and hydroelectric power plants, supplemented by a pumped-storage hydroelectric facility.

**The Concept**

Pumped storage is a process for converting large quantities of electrical energy to potential energy by pumping water from one reservoir to another at a higher elevation. Due to daily variations in the demand for electricity, much of the generating equipment needed to meet peak-load requirements is unused or only partially loaded during low-demand periods. During these low-demand periods, the surplus generating capacity can be used to pump water from one reservoir to a higher one. Then, during peak-load periods, the stored water is released through hydraulic turbines to produce electricity. The pumped-storage concept can be used alone or in conjunction with nuclear, conventional hydroelectric, or fossil-fuel power plants and should be particularly attractive for areas of European Russia with sufficient differences in local elevation to permit economic employment of the concept. At the present time, the Soviets maintain that an elevation difference of at least 400 meters is necessary.

**The Facility**

Located on the Lower Bug River, the South Ukraine Atomic Power Station will consist of a 4,000-megawatt (MW) nuclear power facility, the 1,800-MW Tashlyk

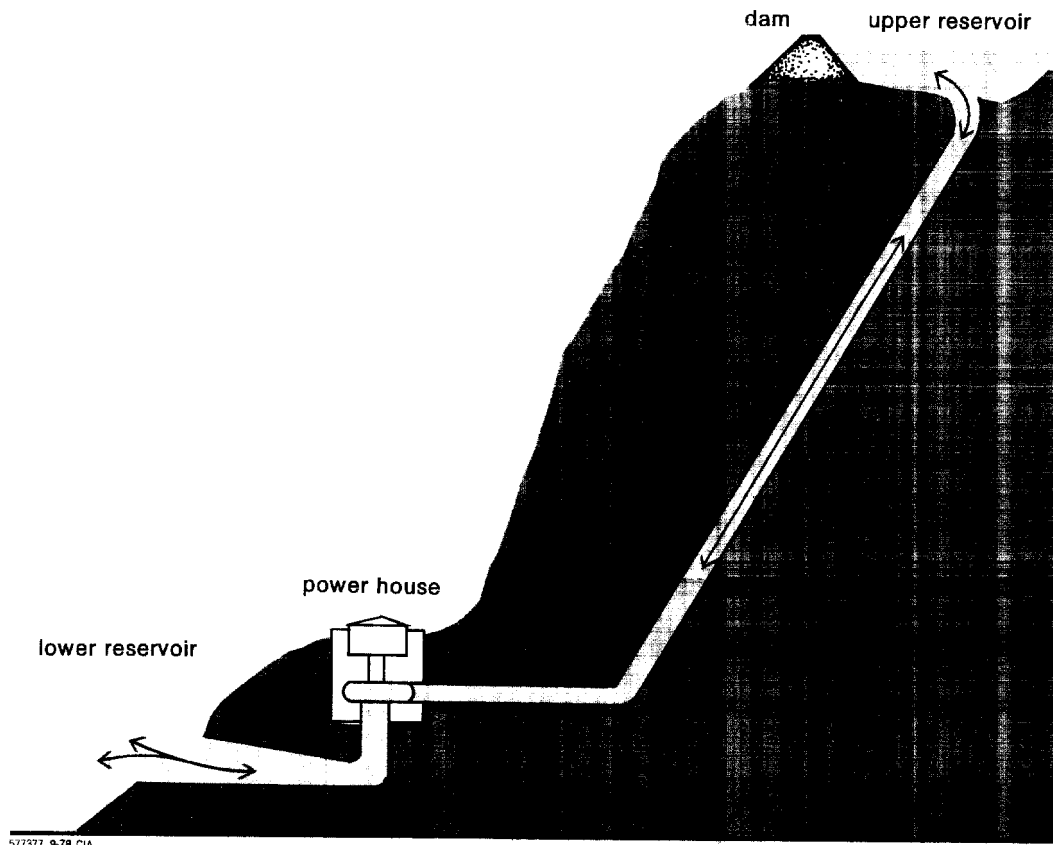
\*This article was prepared by the Office of Scientific Intelligence.

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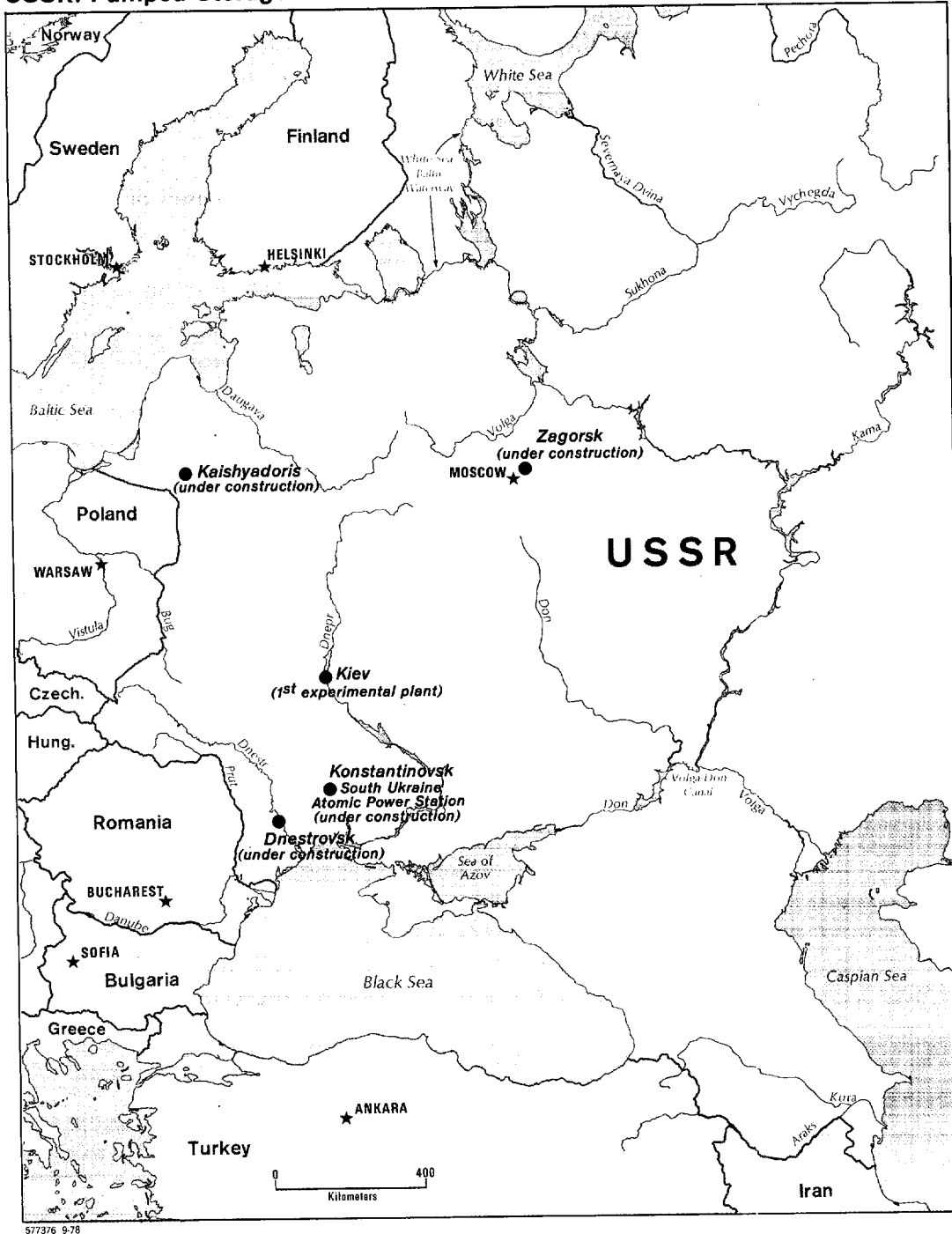
**Schematic of a Conventional Pumped-Storage Facility**

Hydroelectric Station, and the 400-MW Konstantinovka Pumped-Storage Hydroelectric Plant. It will include three interconnected artificial reservoirs at different elevations, each of which will also be connected to the Bug River. The nuclear plant is on the shore of the second highest reservoir, the Tashlyk. The hydroelectric and pumped-storage hydroelectric plants are at the lowest reservoir, the Aleksandrovka. The Konstantinovka Reservoir, located slightly above the Tashlyk, will provide water to operate the pumped plant during peak hours and perform certain additional functions, such as cooling the process water from the nuclear plant and regulating the flow of irrigation water from the Lower Bug River.

Despite this ambitious and impressive plan, the USSR is some 10 to 20 years behind many other industrial nations in pumped-storage electricity generation. The Soviets entered the pumped-storage hydroelectric field in 1972 with an experimental

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# USSR: Pumped Storage Power Plants



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225-MW facility at Kiev. A 1,200-MW plant at Zagorsk, north of Moscow, begun in 1976, is scheduled for completion in 1980, and it will provide peaking power for the Moscow Power Grid. A 1,600-MW Kaishyadorsk plant in Lithuania and Dnestrovsk pumped-storage station (up to 2,000 MW) in the Ukraine are also under construction.

**Outlook**

Experience at the Kiev facility, together with calculations based on the three projects currently under construction, indicate a capital cost for such facilities of 160 to 180 rubles per kilowatt of installed capacity. This is slightly higher than the capital investment cost of a fossil-fuel facility, but pumped storage has lower operating costs and offers fuel savings.

Prospective applications of pumped storage in the Soviet Union exist in peripheral zones of European Russia—including the Crimea, the North Caucasus, the Transcaucasus, and the Urals—where the topography is suitable. The plan to accent construction of nuclear power facilities in European Russia lends emphasis to the importance of the concept of integration of nuclear power with pumped storage. Given the Soviet Union's late start in implementation and relatively modest rate of progress, however, the impact of pumped storage on energy production is not likely to be significant for the foreseeable future. Still, it is evidence of Soviet attempts to achieve greater flexibility and efficiency in use of power generating equipment. (Unclassified)